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Macro-administration refers to the theory and practice in the administration of transinstitutional and trans-societal organizations. These are organizations which extend authority and control over multiple units within society. There are three directions which future research may take in the systematic study of macro-administration in American higher education. These are sub-paradigms derived from other sources, but all of which may be applied to higher education. First, the federation sub-paradigm is based upon the political analogue in which a government of the federation and a set of governments of the member units both rule over the same territory and people, with each retaining some autonomy. These can take the form of a "periphalized" or a "centralized" federation. The second is the sub-paradigm on policy and administrative practice. This would be translated into studies comparing the conceptual behavior of man with the cultural behavior of man within an administrative framework. In the third, the empirical history sub-paradigm, the mathematical formulae suggested by Mason Haire are fitted to institutional growth patterns. Two of the sub-paradigms have a direct relationship in prior use in the real world of research, and the policy administration sub-paradigm is rooted in a firm, logical substantive framework. (DS)

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MACRO-ADMINISTRATION IN AMERICAN HIGHER EDUCATION: SOME RESEARCH DIRECTIONS

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It is a commonplace to observe today that the university has studied the person, his works and most other facets of the world. However, the university has not studied herself. Of course, the cult of efficiency is producing a wealth of data through more institutional research organs coming into being at the state and the institutional level. The self-study approach to institutional accreditation is based upon more information for searching common questions of institutional goals and of input and out than any faculty member or administrator was ever confronted with before. But none of this science has been placed into synthesized state called a discipline of higher education. Indeed, Sanford's encyclopaedic volume, The American College, testifies to this.[1] We are in the natural history stage of inquiry in the field of higher education, as Bacon and Northrop

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[1]Nevitt Sanford (ed.), The American College: A Psychological and Social Interpretation of the Higher Learning (New York: John Wiley and Sons, Inc., 1962).

would have it.[1]

Since the advent of the nation state system and the technological and urban revolutions of the seventeenth, eighteenth, nineteenth and twentieth centuries, the phenonmenon of gross institutional size, textured by organizational complexity, has been and still remains the major fact. National governments and their attendant colonial and regional administrations, business monopolies and industrial cartels, ecclesial and military organizations, philanthropy and human service institutions have evolved into behemothal proportions and technical complexity. Indeed, American higher education has not been spared, either. One can point to giant state systems of higher education formed by "master plans," the regional and national compacts, the Claremont Colleges model, the multiple unit campus, the consortium movement, cooperative arrangements for single or multiple purposes, the regional accreditation system, the cross-institutional and national policy agency such as the American Council on Education, the American Council of Learned Societies, and the National Educational Association to name but a few. These are all examples of macro-administrative arrangements in American higher education.

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[1]Francis Bacon, The New Organon and Related Writings (Library of Liberal Arts Paperback No. 97; Indianapolis, Ind.: The Bobbs-Merrill Company, Inc., 1960), pp 271-284; and F. S. C. Northrop, The Logic of the Sciences and the Humanities (Paperback No. M71; New York: Meridian Books, Inc., 1947, 1959), ch. 3.

These are institutions by which the guild of higher education intersects the university of college at crucial tangents of power.

Macro-administration is a term which I have coined. It means to me the theory and practice in the administration of transinstitutional and trans-societal organizations, that is, organizations which extend authority and control over multiple units and/or which extend over large sectors of the society. Certainly, the power locus in trans-societal organs resides in government; while, the power locus intransinstitutional organs resides within the constituent membership. All of the familiar examples listed above belong to these categories. The next problem is: Can current administrative theory provide guides to macro-administration?

Scientific research in human organizations is providing a substantive basis for administrative theory. March's Handbook of Organizations[1] and Griffith's NSSE 1964 Yearbook, Behavioral Science and Educational Administration[2] provide us with a canvas upon which researchers from a variety of disciplines have sketched in large and small lines what empirically based administrative

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[1]James G. March (ed.), Handbook of Organizations (Chicago: Rand McNally and Company, 1965).

[2]Daniel E. Griffiths (ed.), Behavioral Science and Educational Administration: The Sixty-third Yearbook of the National Society for the Study of Education-Part II (Chicago: The University of Chicago Press, 1964).

theory we possess. Reviewing these and some older bibliographies, I am impressed with one fact. This is that there is little in empirically based conceptual equipment founded upon and developed for macro-administrative organizations. With the current exception of Clark Kerr's The Uses of the University wherein he conceptualizes the macro-administrative organization, styled "the multiversity," the problems of macro-administrative order have not been tackled directly.[1] It is true that the systems analyst, the game theorist, the human modulist, and the simulator may have things to say on issues of macro-administration. Nonetheless, it is also true that their researches, primarily based upon smaller or sub-organizational units, reveal only behavioral principles about these institutions. I find it to be an argument from silence to accept by analogy the application of current administrative theory to macro-administrative structures, which theory was built upon institutions that in critical ways may be very unlike those to which the theory is to be applied.

It is my belief that both the emerging disciplines of higher education and administrative theory can be served through the systematic study of macro-administrative organs in American higher education. Certainly, the evolution of a systematic science

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[1]Clark Kerr, The Uses of the University (TB1264G; New York: Harper Torchbooks- Harper and Row, 1963, 1966), Ch. 1.

about this one area of American higher education will bring reasoned order to what now appears as institutional chaos. Certainly, the eventual development of administrative theory based upon scientific tool applicable to administrators in and out of American higher education. I do not see these possible ends as conflicting, though different by co-equal and collateral research questions will be required to achieve each of them.

What research directions seem to be live options for the systematic study of macro-administration in American higher education? Of course, these options depend upon the state of the field, the character of the questions asked by the researcher, and the conceptual equipment available to pursue these researchable questions.

The present state of our knowledge about macro-institutions in American higher education is small but growing. What is needed is the most fundamental of scientific knowledge, viz., valid observations and descriptions. More case studies like Abbott's Government Policy and Higher Education are required.[1] More class studies like Glenny's Autonomy of Public Colleges[2]

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[1]Frank C. Abbott, Government Policy and Higher Education: A Study of the Regents of the State of New York, 1784-1949 (Ithaca, N.Y.: Cornell University Press, 1958).

[2]Lyman A. Glenny, Autonomy of Public Colleges: The Challenge of Coordination (New York: McGraw-Hill Book Company, Inc., 1959).

and Adams and Cumberland's United States University Cooperation in Latin America are needed.[1]

Also, descriptive surveys such as Ertell,[2] Anderson,[3] Martorana and Hollis,[4] Martorana, Messersmith, and Nelson,[5] and the Council on State Government studies on interinstitutional cooperative arrangements[6] and state higher education study commissions prove to be of important encyclopaedic value.[7] To these

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[1]Richard N. Adams and Charles C. Cumberland, United States University Cooperation in Latin America (East Lansing, Mich: Michigan State University - Institute of Research on Overseas Programs, 1960).

[2]Martin W. Ertell, Interinstitutional Cooperation in Higher Education: A Study of Experience with Reference to New York State (Albany, N.Y.: University of the State of New York - State Education Department, 1957).

[3]Wayne W. Anderson, Cooperation within American Higher Education (Washington, D.C.: Association of American Colleges, 1964).

[4]S. V. Martorana and Ernest V. Hollis, State Boards Responsible for Higher Education (OE53005-Circular No. 119; Washington, D.C.: U.S. Department of Health, Education and Welfare - Office of Education, 1960).

[5]S. V. Martorana, James C. Messersmith, and Lawrence O. Nelson, Cooperative Projects among Colleges and Universities (OE50020-Circular No. 649; Washington, D.C.: Department of Health, Education and Welfare - Office of Education, 1961).

[6]Council of State Governments, Interinstitutional Cooperative Arrangements and Agreements Across State Boundaries in the Midwest involving State-Supported Colleges and Universities (Chicago: The Council and the Midwestern Advisory Committee on Higher Education, 1963).

[7]Council of State Governments, State Higher Education Study Commissions: A Summary of Their Organization, Staff, Activities and Financing (Chicago: The Council, 1959).

we can add Kerr's Uses of the University,[1] and Peter Sammartino's Multiple Campuses[2] to that genre of literature written by the practitioner and which provide pragmatic insight rather than scientific data.

Descriptive studies, be these case or group studies, are not organized, necessarily, upon lines which bring conceptual abstraction and integration to the topics investigated. The Abbott study on the New York Regents is historical. The genetic evolutionary pattern is inherent therein. However history is concern with the singular, the unique, the particular case in time only. Only with a number of collateral case studies can a useful generalization or abstraction be made that is related substantively to the specific reality of particulars.

Glenny's study on coordination is a status study comparing and contrasting three patterns of coordinating agencies found in operation. His ten conclusions on these three patterns of higher education coordination in America are a second level description. The isolable governing units, categorized into three class models of coordination, were studied as models.

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[1]Kerr, op. cit.

[2]Peter Sammartino, Multiple Campuses (Rutherford, N.J.: Farleigh Dickenson University Press, 1964).

The descriptions and generalizations which Glenny arrives at are about the object model category rather than the isolable particular coordination agency. Hence, the term second level description is used because Glenny's descriptions and conclusions are abstracted one level from the particular case. Glenny's description is one step closer to the development of administrative theory about macro-administration.

In the brilliant essay, The Structure of Scientific Revolutions, Thomas Kuhn historically documents the role of normal science to be a puzzle-solving process within a given intellectual paradigm for any particular science in time. A scientific revolution occurs when the limits of the paradigm have been virtually exhausted by its inability to explain all the observations found in nature. The historical evolution of a new more comprehensive paradigm is obtained. Gradually, it becomes accepted and normal science as puzzle-solving works again as the scientific investigator studies his science within the confines of the new expanded intellectual structure.[1]

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[1]Thomas S. Kuhn, The Structure of Scientific Revoluions (Phoenix Paperback No. P159; Chicago: The University of Chicago Press, 1962). See also, Norwood Russell Hanson, Patterns of Discovery: An Inquiry into the Conceptual Foundations of Science (Cambridge: At the University Press, 1958).

A brief observation of the historical development of the social sciences reveals that there is a tendency toward developing larger comprehensive patterns of collecting, organizing and interpreting data. The oldest social science, history, moved from myth, saga, annal, and institutional history to kulturgeschichte and comprehensive history. Institutional economics to empiricized macro- and micro-economics, philosophical psychology to the psychic organism, social, political and anthropological studies to concepts of culture, society and the social system, are other well known examples. It appears to me that the most comprehensive paradigm in the social sciences today, in Kuhn's sense of paradigm, is the social system, technically explicated by Parsons and others.[1] Most social science research today appears to be problem-solving within this paradigm of the social system. And the suggested research directions that appear as live options to me, will be the puzzle-solving process of normal science within the paradigm of the social system.

For this paper, I will suggest three research directions for the systematic study of macro-administration in American higher education. Each of these research directions is based

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[1]See, Talcott Parsons and Edward A. Shils (eds.), Toward a General Theory of Action (Cambridge, Mass.: Harvard University Press, 1951); and Talcott Parsons, The Social System (Glencoe, Ill.: The Free Press, 1951).

conceptually upon the nature of the macro-administrative organization. Each of these directions is a sub-paradigm for the development of administrative theory about the macro-organization as a class of social institution within the American social system. The three subparadigms are: (1) the federation subparadigm; (2) the policy and administrative practice subparadigm; and (3) the empirical history subparadigm.

These three sub-paradigms were selected because each provides an insightful "handle" to research some class of problems systematically. The intent of the federal subparadigm is to determine the nature of the macro-administrative organization in terms of the historic principle of federalism, which has organized much of American life. The historic autonomy of American colleges and universities present the building blocks of many quasi-federal and federal organs which are designed to achieve larger and more comprehensive ends than individual resources permit. The policy and administrative practice subparadigm provides a formal substantive analysis system of policy and practice in the macro-organization. The empirical history subparadigm is an attempt to plot the qualitative patterns of macro-organizational development in quantiative terms so that comparative principles of institutional regularities in dissimilar formal orderings can be elicited.

THE FEDERATION SUBPARADIGM

. The historical development and geographic dispersion of American colleges and universities, both public and private, rested upon the legally autonomous corporate institution. Autonomy is a very strong characteristic of American higher education. However, societal conditions and changing values are reducing unbridled institutional autonomy.[1] This reduction of autonomy takes on many casual, informal voluntary patterns as well as involuntary and highly ordered arrangements.[2] Regardless of the coalescent forces that constrain the direction, the emerging pattern can be broadly characterized as federal, a political analogue translated into American academic administration. What is the federation paradigm? How does it provide a research direction within the larger paradigm of the social system?

The essential institutions in a federation are a government of the federation and a set of governments of the

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[1]Logan Wilson, "Myths and Realities of Institutional Independence," in Logan Wilson (ed.), Emerging Patterns in American Higher Education (Washington, D.C.: American Council on Education, 1965), pp. 18-28. For contervailing argument, see, M. M. Chambers, Freedom and Repression in Higher Education (Bloomington, Ind.: The Bloomcraft Press, Inc., 1965).

[2]For interesting observations and thought against the evils of over-centralization, see the case studies discussions by Chambers. See, Chambers, op. cit., Chs. 2-3.

member units in which both kinds of governments rule over the same territory and people. And each kind of government has authority to make some decisions independently of the other.[1] "The essential relationship involves a division of activities between the autonomous parts and the common organs of the composite whole /organization/."[2]

Such arrangements have many variant forms. Indeed, there is a range of possibilities in these arrangements for developing either a "peripheralized" federation or a "centralized" federation.[3] These federation types represent the degree of autonomy residing in either the central government of the federation; or conversely, the degree of autonomy residing in the constitutent member of the federation. The peripheralized federation is described to be that federation government in which the rulers of the central government can make decisions in only one narrowly restricted category of action without prior approval

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[1]Arthur W. MacMahon, "Federation," Encyclopedia of the Social Sciences, VI, 172-177.

[2]Ibid., p. 175.

[3]William H. Riker, Federalism: Origin, Operation, Significance (Boston: Little, Brown and Company, 1964), pp. 5-10. See also the classic work, K. C. Wheare, Federal Government (3rd ed.; London: Oxford University Press, 1953), Chs. 1-3.

of the constitutent governments. Hence, the peripheralized federation has a central government of minimum autonomy.[1] From the point of view of the common government of a centralized federation, maximum autonomy obtains when the rulers of the federation can make binding decisions without prior consultation with the rulers of the member governments in all but one narrowly restricted category of action.[2] A typology of these two federalisms in Chart No. 1, illustrates this autonomy principle.

Thus, there is rule for identifying a federalistic type governmental organization. A constitution, formal or informal, is federal if: (1) two levels of government rule the same land and people; (2) each level of government has at least one area of action in which it is autonomous; (3) there is some explicit guarantee of the autonomy of each government in its own sphere.[3]

Of particular interest is Riker's concept of the federal bargain which is encased in constitutional form. Riker's reading of history sees this bargain between prospective national leaders and officials of constituent governments for purposes of

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[1]Riker, op. cit., pp. 5-6.

[2]Ibid.

[3]Ibid. p. 11.

aggregating territory, the better to lay taxes and raise armies. He characterizes these purposes as predispositions, or as the expansion condition and the military condition.[1]

I believe that the federation paradigm is an appropriate political analogue through which to examine macro-administrative structures in American higher education, whether that have a monolithic appearing structure or a clearly delineated federal form. The problems of centralization and decentalization in macro-organizations seem to become problems of the federal bargain and not the elementary principle of correct delegation of authority alone. As a pattern of organization, federation has effected much social development in the United States. It would not be inappropriate to investigate the existence and viability of this pattern of organizational strucutre, development and control in American higher education, especially in macro-administrative organizations.

Permit me to call your attention to Chart No. 2. This chart suggests a classification system of macro-organizations in American higher education according to Riker's concept of centralized and peripheralized federal patterns. Also, the chart suggests a cross-classification pattern of two categories. The principle of these categories is the locus of power, one category being

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[1] Ibid., pp. 11-13.

"trans-societal" wherein the locus of power rests in government, the other category being "transinstitutional" wherein the locus power resides in institutions and groups of professionals. The detailed study of some of these macro-organizations would most assuredly test out the validity of the Riker concept of federation, as well as the classifications suggested in Chart No. 2. But more important, the federal paradigm might well be a viable concept for understanding macro-administration.

The Riker concept of the federal bargain would be another way to bring understanding to macro-administration. In what sense is the federal bargain applicable to both unitary and plural unit macro-organizations in American higher education? Though the military condition does not obtain as an analogue of predisposing conditions in American higher education, most certainly the expansionist condition does apply. Are not enlarged educational goals complicated educational tasks expansionist? Are not common goals common cause? Whether peripheralized or centralized, whether unitary or plural, the federal bargain structures the political form. Is this political analogue too far removed from the political experiences of American higher education? Indeed, if this principle is found to be a viable one, it could certainly become a useful research tool for developing macro-organizational theory.

Weidner's excellent study on conflict and decision-making in a federal system provides another aspect to the federal subparadigm. He suggests that there are two sources and categories of values among and in federal arrangements. The one source are those values stemming from units of governments, agencies or persons. These are values involving the preservation and extension of influence involved with expediency and conservation goals. The second source are those values stemming from program or substantive policies, such as principles, organizational goals and adequate standards of public service. Within the federal organization's decision-making processes, Weidner extracted conflict situations arising out of the following: (1) competing expediency values; (2) competing programmatic values; (3) competition between expediency and programmatic values.[1]

Weidner writes:

> Federalism implies that there is a variety of political values in a nation for which allowances need to be made. It is more than a neutral centralizing or decentralizing device. Historically it has been a unifying device that took cognizance of the fact that political goals and values, and hence single public policies for a society would be developed only in those matters over which the central government was

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[1]Edward W. Weidner, "Decision-Making in a Federal System," in Arthur W. Macmahon (ed.), Federalism: Mature and Emergent (Garden City, N.Y.: Doubleday and Company, Inc., 1955), pp. 363-383.

> given jurisdiction. State participation in public policy would automatically mean lack of uniformity and recognition of alternative and even competing political views.[1]

It seems to me that Weidner's notion on conflict in federal decision-making is a useful analogue from the political realm that can be tested in macro-organizations of American higher education. Certainly, the potential of his analysis as a research pattern in the macro-administrative situation is worthy of investigation. If successful, another viable principle in macro-administration might be developed from it. If no success obtains, positive error brings positive knowledge, a benefit for theory development.

The whole federation subparadigm appears to me to be a live option for researching macro-organizations in American higher education. Its potential for theory development seems promising.

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[1] Ibid., p. 367.

THE SUBPARADIGM ON POLICY AND ADMINISTRATIVE PRACTICE

The character of this subparadigm for research into macro-administration is based upon logical and substantive relationships between policy and administrative practice. Chart No. 3 summarizes these relationships; and its explication follows.

Policy is here held to be a propositional argument wherein are contained two elements, viz., means (M) and ends (E). The structural relationships of these two elements is stated to be one of implication. Hence, the general principle of these elements in a policy statement is stated symbolically as $M \supset E$ and $E \supset M$, viz., the means (M) implies the ends (E) and the ends (E) implies the means (M).

On the other hand, administrative practice is and actional and pragmatic situation in which the policy statement is reflected in specific process (P_1) and specific product (P_2). The pragmatic principle of administrative practice is symbolically states as follows:

$$(\exists P_1) \rightarrow (\exists P_2); \text{ and} \qquad [1]$$

$$(\exists P_2) \leftarrow K(\exists P_1). \qquad [2]$$

The first symbolic proposition reads: There is a given process (P_1) which yields a given product (P_2). The second symbolic proposition reads: There is a given product (P_2) such that can be produced by a given class (K) of processes (P_1). These symbolic propositions

represent the actual pragmatic or actional relation between process (P_1) and product (P_2).

In debates over specific policies to guide government or other administrative organization, there are a whole family of justification logics used to prove or to refute the merits of competing policy approaches. This subparadigm presents the total family of justification logics possible in policy debates. This subparadigm of justification logics is possible only because of two intellective translation principles which link policy and administrative practice. These two translation principles link two orders of reality, viz., the conceptual behavior of man in the form of a propositional statement of means and ends and the actional behavior of man in the form of the act of a specific process yielding product or service.

The first translation principle is that of reification. Through this principle a given proposition (concept) is made physically palpable in act and product. The second translation principle is abstraction. Through this principle, a given act or product is conceptualized into propositional form. Through these two intellective principles are policy and administrative practice related substantively and logically.

The total family of justification logics is divided into two groups: one which justifies means (M); the other which justifies ends (E). Within each of these two categories,

there are three justification logics: (1) justification by process; (2) justification by product; (3) justification by evaluation. This total family of logic patterns exhaust all the logical possibilities of this subparadigm. But it is the purpose of this subparadigm to guide research to see which of these logics obtains in macro-administration as practiced in American higher education. Perhaps, there are certain justification logics more prevalent in given classes of policies or given classes of functions or a given class of institution.

Below Chart No. 3, the whole family of possible justification logics of this subparadigm on policy and administrative practice. Permit me to read each of these symbolic statements in their standard English form.

(1) $M \Rightarrow (\exists P_1) \Rightarrow E$ = There is a means (M) which implies by reification a given process (P_1) which implies by abstraction to be a desired end (E). /This is a means justification logic by use of process./

(2) $M \Rightarrow (\exists P_2) \Rightarrow E$ = There is a means (M) which implies by reification a given product (P_2) that implies by abstraction to be a desired end (E). /This is means justification logic by use of product./

(3) $M \Rightarrow (\exists P_1) \rightarrow (\exists P_2) \Rightarrow E$ = There is a means (M) which implies by reification a given process (P_1) that yields a given product (P_2) that implies by abstraction to be the desired end (E). /This is a means justification logic by evaluation, that is, the specific knowledge ($\exists P_1$) $K(\exists P_2)$ is known and is the reality testing device of this justification./

(4) E ⇒ (∃ P_2) ⇒ M = There is an end (E) which implies by reification a specific product (P_2) which by abstraction implies a generalized means (M). /This is an ends justification logic by use of product./

(5) E ⇒ (∃ P_1) ⇒ M = There is an end (E) which implies by reification a process (P_1) which by abstraction implies a generalized means (M). /This is an ends justification logic by use of process./

(6) E ⇒ (∃ P_2) ⟵ K(∃ P_1) ⇒ M = There is an end which implies by reification a given product (P_2) that is yielded by a given class (K) of processes (P_1) which implies by abstraction to be a generalized means (M). /This is an ends justification by evaluation, that is, the specific knowledge (∃ P_1) K(∃ P_2) is known and is the reality testing device of this proposition./

This subparadigm on policy and administrative practice provides a logical and substantive framework for a content analysis of macro-administration policies and actions. In the absence of specific evaluative data, which justification logics are resorted to? Which logics seem to elicit more confidence and support the administrative action of the macro-administrator? I believe excellent comparative studies based on this subparadigm are possible.

THE EMPIRICAL HISTORY SUBPARADIGM

In a well known 1959 paper, Mason Haire suggested the fitting of mathematical formulae of biological growth patterns to business organizations.[1] He chose two formulae. The first was the well known exponential or logarithmic growth pattern, the curve of $y = a^x$ or $y = \log_a x$ being the theoretical form. The second formula was the square-cube law of biological growth, viz., as the surface grows at the rate of the square, the mass or volume grows at the rate of the cube.

There is much attraction to the application of these conceptual analogues of biological growth to human organizations. And the use of these biological patterns is worth a try. Haire reports on four companies that ranged from 200 to 2000 employees in size. He had business records that ranged from 7 to 37 years since the founding of these companies. On the whole he presents convincing evidence that his approach is viable. However, there are several issues of theoretical significance which are in need of clarity. Starbuck has written an excellent critique on this

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[1]Mason Haire, "Biological Models and Empirical Histories of the Growth of Organizations," in Mason Haire (ed.), Modern Organizational Theory: A Symposium of the Foundation for Research on Human Behavior (New York: John Wiley and Sons, Inc., 1959), pp. 272-306.

paper.[1]

I suggest the use of Haire's empirical history approach as the third subparadigm for the study of macro-administration in American higher education. I do believe that class studies of any of several organizational types would bring principle to an unvarified supposition of the "natural development" of organizational growth, especially on the issues of the relationship between functions, size and technical differentiation within. For purposes of demonstrating the utility of this subparadigm, I have produced one case study along the principles of Haire's paper. The institution is the Pennsylvania State University from 1950-1966.

Haire asserts that growth in terms of numbers of employees is described by the following equation:

$$\frac{dN}{dt} = N \log_e R. \qquad [1]$$

This equation reads: the increment in number over a given period of time is equal to the base number of the specific time t_o multiplied by the natural logarithm of the rate of increase. However, such growth does not occur in nature without the limitations imposed by genetic and environmental factors. Hence,

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[1]William H. Starbuck, "Organizational Growth and Development," in Mahlak, op. cit., pp. 482-484. See also, Thomas Park, "Population Ecology," Encyclopaedia Britannica (1955 ed.), XVIII, 236-239B.

Haire suggests that Equation No. 1 needs a biasing factor. This he does in the first formula as follows:

$$\frac{dN}{dt} = \left(\frac{K - N}{K}\right) N \log_e R. \qquad [2]$$

Chart No. 4 presents the basic data on the full time employees of the Pennsylvania State University for three year periods from 1950-1966. These were provided by the Comptrollers Office. The classification of occupation comes the Comptrollers payroll records.

In order to determine the theoretical growth curve for full time employees of the Pennsylvania State University, the rate (R) must be determined. Haire took the number of the first generation of employees and divided that quantity into the next succeeding generation of employees of the following year. This I did also. Chart No. 5 provides the rate for employee development at Penn State per each three year period.

The answer to the question as to what controls employee expansion in the university per annum provides the clue for the development of the biasing factor (K). Of course, it is the budget. But a rate of development based upon persons and not money was needed. To resolve this problem, the student enrollment was used because the size of the budget determined the number of students serviced. Hence, using the same principle of rate development as applied to the enployee growth rate (R), Chart No. 5 provides the growth rate (K) for the Penn

State student body for the same time periods. The calculation of the total equation's biasing factor $\frac{K - N}{K}$ is found in Chart No. 5. Chart No. 6 is the calculation chart for the theoretically biased equation per each three year period. The theoretical values derived from the two growth equations are compared with the actual numbers of employees in the university at the state periods of time. These values are very close. Chart No. 7 gives these numbers comparatively. Chart No. 8 presents the curve plotted from the values obtained from Equation No. 2. The star plot points record the actual numbers of full time employees at the given time periods. One can graphically see a high correlation between them.

This part of the empirical history subparadigm demonstrates that the growth pattern of full time employees at the Pennsylvania State University for the 1950-1966 period paralleled the theoretical logistic curve of $y = \log_a x$. Mason Haire got similar results in his study.

A second part of this empirical history subparadigm is the application of the square-cube law to institutional growth. The square-cube law of physical growth states the relationship that the surface grows at the rate of the square as the volume grows at the rate of the cube. But how does one apply this physical analogue of surface and volume to human organizations like the Pennsylvania State University? Haire's

resolution was to classify his companies' employees either as "inside" or "outside." Haire's notion is naive and he says so himself.

Not rationally better than Haire's classification, I used the classes of line/staff and professional/non-professional. The direct producers of educational services (line and professional) were considered as those least likely to differentiate rapidly within the institution. The support services personnel (staff and non-professional categories) were considered to differentiate technically in work as the organization grew in size. Hence, the supposition that the direct producers differentiated less rapidly guided my selection that they would be put subject to the rule of the square, while the support services personnel would be made subject to the rule of the cube for the mathematical purposes of the square-cube analogue. Mathematically, the square root of the line employees was plotted against the cube root of the staff employees in one instance. In the second instance, the square root of the professional employee numbers was plotted against the cube root of the non-professional employees. Charts Nos. 9-13 provide the calculation of those points, the regression computations, and the resultant graphed lines on abbreviated scaled charts.

The comparison of these data of the Pennsylvania State University employee growth to the square-cube law regression

lines is most interesting. Firstly, the correlation coefficients of the PSU data to the regression lines were of the same high orders as those in Haire's study, viz., .99.

Secondly, the slopes of the PSU employee growth lines were of a different magnitude. The PSU slopes were .46 for the line/staff line and .14 for the professional/non-professional line. Haire's slopes were of a higher magnitude, viz., .72, .51, .50, and .97. It seems that the definition of line/staff groups most likely fitted Haire's inside-outside categories; hence, this degree of comparability can be seen. It would be of interest to see whether a family of lines with similar slopes can be found for colleges and universities as a class.

In summarizing this part of the application of the square-cube law part of the subparadigm of empirical history, it seems to be demonstrated that PSU employee growth patterns can be studied profitably by the comparison of these with other macro-organizations, given the comparability of definitionalized data. I must hasten to add that the high degree of correlation of data to the regression line must not be understood purely as a function of reality, for it is in the nature of the formal character of plotting progressive linear values. What seems more important to me would be the development of a general principle based upon a family of lines with similar sized slopes.

In terms of the line/staff division of employees, Chart No. 14 indicates that there has occurred a stabilization of line employees (faculty) at about 33 percent with the staff stabilizing at about 66 percent. The professional/non-professional categories reveal that there is a stabilization at about 50 percent for each group. Haire's study showed two patterns. One group of firms stabilized at about 50 percent for staff; the second two firms stabilized their staffs at about 25 percent. Here the principle of stabilization over time is illustrated in both business and Penn State. However, the natures of the businesses in Haire's study and the university differ. The degree of comparability in meaning of these percentage stabilization patterns rest solely on the definition artifacts related to the different character of the enterprises. Charts Nos. 14 and 15 present the PSU pattern.

The growth of large corporate structures is growth in actual numbers. But technical differentiation within the organization is indicated by the relative numberical sizes of such employee groups as management and clerical staff. A comparison of the Pennsylvania State University with Haire's company with over 200 employees is possible on these counts. The following percentages are based upon total employees. Penn State over the 1950-1966 period had a range of 4.2 percent - 7.0 percent in the

executive and administrative payroll. Haire's company had a 4.1 percent for top and middle management. Further, PSU's clerical staff for the same time period ranged from 16.5 percent - 18.6 percent; and Haire's large corporation averaged 14 percent. On this score there seems to be high comparability of operational differentiation between Penn State and a large company, especially when the categories seem very comparable.

The use of the empirical history subparadigm as suggested by Haire seems to be a live option for the study of macro-organizations in American higher education. This brief view of the Pennsylvania State University in terms of employee growth illustrates for me the great viability of this research direction for generating substantively based administrative theory as well as getting scientific data on the nature of American higher education in an age of macro-organizations.

In fine, the selection of these three subparadigms --- the federation subparadigm, the policy and administrative practice subparadigm, and the empirical history subparadigm --- as research directions into macro-organizational theory and American higher education was based upon their conceptual nature to focus upon data in comprehensive and holistic patterns. I trust that my means justification logic is not solely seen as one based upon untried means. Two of the subparadigms have

direct relationship in prior use in the real world of research; and the policy-administrative practice subparadigm is rooted in a firm logical substantive framework. I hope my justification for these research directions is rooted in a means justification based upon some evaluation.

CHART NO. 1

TYPOLOGY OF FEDERATIONS ACCORDING TO CENTRAL GOVERNMENT AUTONOMY

FEDERATION PATTERNS	DEGREE OF CENTRAL GOVERNMENT AUTONOMY: High	DEGREE OF CENTRAL GOVERNMENT AUTONOMY: Low
Centralized	+	-
Peripheralized	-	+

CHART NO. 2

TYPOLOGY OF MACRO-ORGANIZATIONS IN AMERICAN HIGHER EDUCATION

		AMERICAN HIGHER EDUCATION MACRO-ORGANIZATIONS	
		Trans-societal (Government Power Locus)	Transinstitutional (Institutional Power Locus)
FEDERAL PATTERNS	Centralized	State Governing Boards	Professional Associations of Institutions and Persons
	Peripheralized	State Voluntary Coordinating Agency Regional + National Compacts	Bilateral + Multilateral Arrangements and Agreements

CHART NO. 3

RECONSTRUCTED JUSTIFICATION LOGICS IN POLICY AND ADMINISTRATIVE PRACTICE

POLICY		TRANSLATION PRINCIPLES	ADMINISTRATIVE PRACTICE	
GENERAL PRINCIPLES	Means (M)		Process (P_1)	PRAGMATIC PRINCIPLES (E_{P_1}) ⟷ (E_{P_2}) ⟷ K(E_{P_1})
		Reification →		
	Ends (E)	← Abstraction	Product (P_2)	

Means Justification Logics:

(1) M ⇒ ($\exists P_1$) ⇒ E — Means Justification/Process

(2) M ⇒ ($\exists P_2$) ⇒ E — Means Justification/Product

(3) M ⇒ ($\exists P_1$) ⟶ ($\exists P_2$) ⇒ E — Means Justification/ Eval.

Ends Justification Logics:

(4) E ⇒ ($\exists P_2$) ⇒ M — Ends Justification/Product

(5) E ⇒ ($\exists P_1$) ⇒ M — Ends Justification/ Process

(6) E ⇒ ($\exists P_2$) ⟵ K($\exists P_1$) ⇒ M — Ends Justification/ Eval.

CHART NO. 4

THE PENNSYLVANIA STATE UNIVERSITY: FULL TIME EMPLOYEES, 1950-1966

Fiscal Year	Exec. + Adm.	Acad.	Prof.	Semi-Prof.	Cler.	Tech. Serv.	Sup'y	Total
1950-1951	173 (4.7)	1294 (35.3)	388 (10.6)	---	677 (18.5)	940 (25.7)	191 (5.2)	3663 (100.0)
1953-1954	155 (4.2)	1371 (37.1)	402 (10.9)	---	686 (18.6)	939 (25.4)	141 (3.8)	3694 (100.0)
1956-1957	201 (4.8)	1586 (37.9)	412 (9.8)	---	702 (16.8)	1211 (28.8)	78 (1.9)	4190 (100.0)
1959-1960	301 (6.3)	1679 (34.9)	465 (9.7)	97 (2.0)	798 (16.5)	1348 (28.0)	126 (2.6)	4814 (100.0)
1962-1963	381 (7.0)	1763 (32.2)	479 (8.8)	162 (3.0)	919 (16.9)	1595 (29.2)	151 (2.9)	5450 (100.0)
1965-1966	421 (6.5)	2179 (33.7)	545 (8.4)	216 (3.3)	1118 (17.3)	1809 (28.0)	172 (2.8)	6460 (100.0)

CHART NO. 5

BIASING VALUE $\frac{K - N}{K}$ CALCULATION CHART, PSU

Fiscal Year	Resident Students		Full Time Employees		K - N	$\frac{K - N}{K}$
	Number	Rate (K)	Number	Rate (N)		
1950-1951	13,284	1.000	3663	1.000	----	----
1953-1954	13,212	1.005	3694	1.008	-.003	- .003
1956-1957	16,045	1.214	4190	1.134	.080	.066
1959-1960	20,377	1.267	4814	1.149	.118	.093
1962-1963	25,712	1.262	5450	1.132	.130	.103
1965-1966	28,334	1.102	6460	1.185	-.083	-.075

CHART NO. 6

CALCULATION CHART OF LOGISTIC EQUATION ESTIMATES, PSU

Fiscal Years	$\frac{K - N}{K}$	Full Time Employees (N)	R	$\log_e R$	Equation No. 1 Estimates $N \log_e R$	Equation No. 2 Estimates $\frac{K - N}{K} N \log_e R$
1950-1951	----	3663	1.000	0.00000	----	----
1953-1954	-.003	3694	1.008	0.00995	36.45	- .109
1956-1957	.066	4190	1.134	0.12282	451.48	28.80
1959-1960	.093	4814	1.267	0.13976	585.59	54.46
1962-1963	.103	5450	1.132	0.12222	588.37	60.60
1965-1966	-.075	6460	1.185	0.17395	948.03	-71.10

CHART NO. 7

COMPARATIVE CHART OF ACTUAL PSU FULL TIME EMPLOYEES AND THEORETICAL EMPLOYEE NUMBERS BY EQUATIONS NOS. 1 AND 2

FISCAL YEARS	ACTUAL PSU EMPLOYEES	EQUATION NO. 1 ESTIMATES	EQUATION NO. 2 ESTIMATES
1950-1951	3663	-----	-----
		(36.45)	(-.109)
1953-1954	3694	3699	3699
		(451.47)	(29.80)
1956-1957	4190	4145	4175
		(585.59)	(54.46)
1959-1960	4814	4776	4830
		(588.37)	(60.60)
1962-1963	5450	5402	5463
		(948.03)	(-71.10)
1965-1966	6460	6398	6327

CHART NO. 8

CURVE OF EQUATION NO. 2 AND ACTUAL PSU FULL TIME EMPLOYEES PLOTS BY FISCAL YEAR

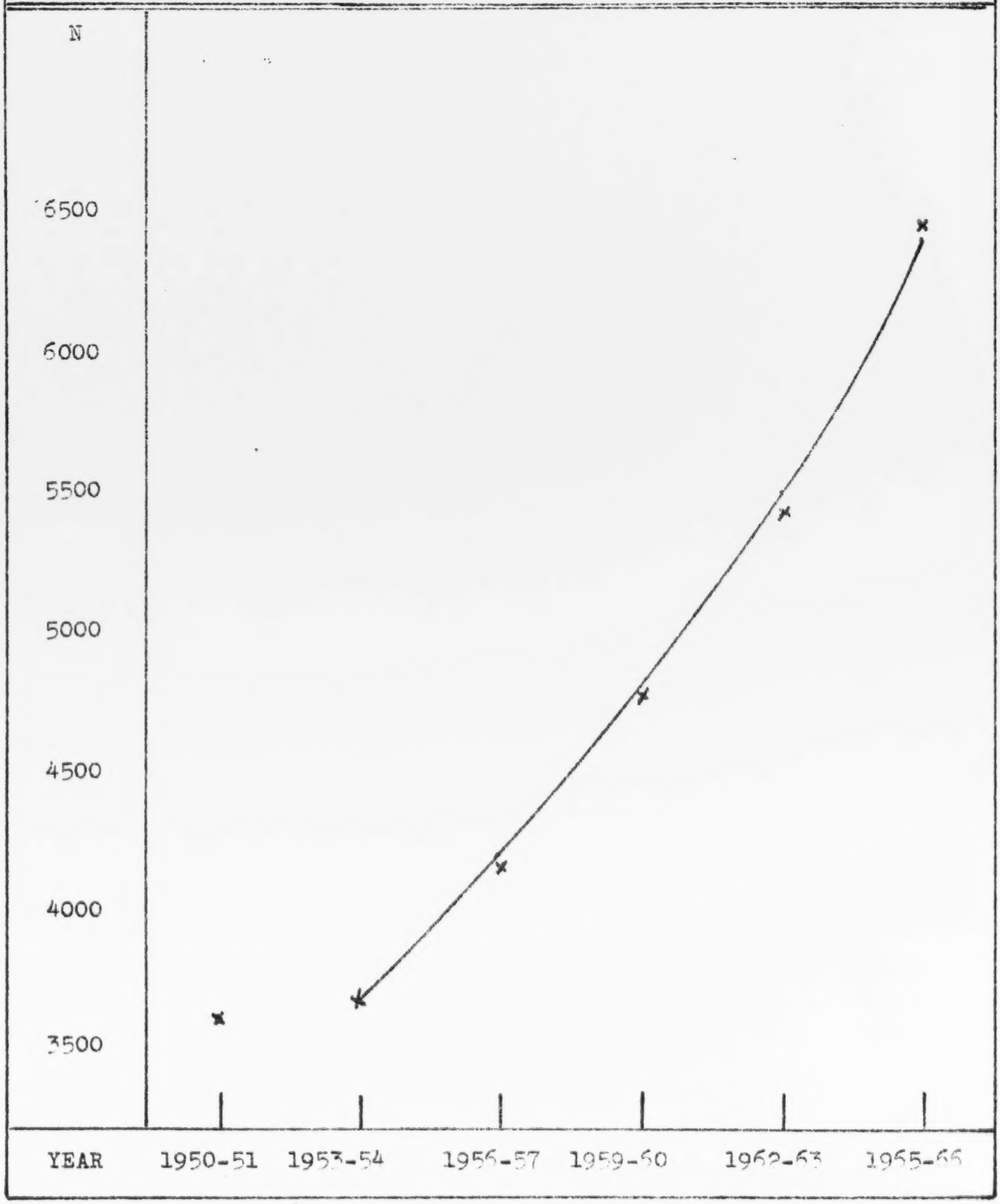


CHART NO. 9

CALCULATION CHART ON LINE/STAFF EMPLOYEES, PSU

Fiscal Year	X Line Employees		Y Staff Employees	
	N	$\sqrt{N}$	N	$\sqrt[3]{N}$
1950-1951	1294	35.972	2369	13.330
1953-1954	1371	37.027	2323	13.241
1956-1957	1586	39.825	2604	13.769
1959-1960	1679	40.973	3135	14.639
1962-1963	1763	41.987	3687	15.448
1965-1966	2179	46.682	4281	16.237

CHART NO. 10

REGRESSION CALCULATION CHART, LINE/STAFF EMPLOYEES, PSU

Fiscal Year	Staff Y	Line X	Y^2	X^2	XY	Y + X	$(Y + X)^2$
1950-1951	13.3	36.0	176.9	1296.0	478.8	49.3	2430.5
1953-1954	13.2	37.0	174.2	1369.0	488.4	50.2	2520.0
1956-1957	13.8	39.8	190.4	1584.0	549.2	53.6	2873.0
1959-1960	14.6	41.0	213.2	1681.0	598.6	55.6	3091.6
1962-1963	15.4	42.0	237.2	2001.2	646.8	57.4	3294.8
1965-1966	16.2	46.7	262.4	2180.9	756.5	62.9	3956.4
Σ	83.5	242.5	1254.3	10112.1	3518.3	329.0	18166.3

Slope: b = .461

Intercept: a = 32.5

Regression Equation: Y = 32.5 + .461X

Correlation Coefficient: r = .988

CHART NO. 11

CALCULATION CHART ON PROFESSIONAL/NON-PROFESSIONAL EMPLOYEES, PSU

Fiscal Year	X Professional Employees		Y N-Professional Employees	
	N	N	N	N
1950-1951	1855	43.07	1808	12.18
1953-1954	1928	44.93	1766	12.09
1956-1957	2199	46.90	1991	12.68
1959-1960	2592	50.91	2272	13.15
1962-1963	2785	52.77	2665	13.87
1965-1966	3371	58.06	3099	14.58

CHART NO. 12

REGRESSION CALCULATION CHART, PROFESSIONAL/NON-PROFESSIONAL EMPLOYEES, PSU

Fiscal Year	NON-P Y	P X	Y^2	X^2	XY	Y + X	$(Y + X)^2$
1950-1951	12.2	43.1	148.8	1856.6	525.8	55.3	3113.6
1953-1954	12.1	44.9	146.4	2016.0	543.3	57.0	3249.0
1956-1957	12.7	46.9	161.3	2199.6	595.6	59.6	3552.2
1959-1960	13.2	50.9	174.2	2590.8	671.9	64.1	4108.8
1962-1963	13.9	52.8	193.2	2787.8	733.9	66.7	4448.9
1965-1966	14.6	58.1	213.2	3375.6	848.3	72.7	5285.3
Σ	78.7	296.7	1037.1	14826.4	3914.8	375.4	23757.8

Slope: b = .149

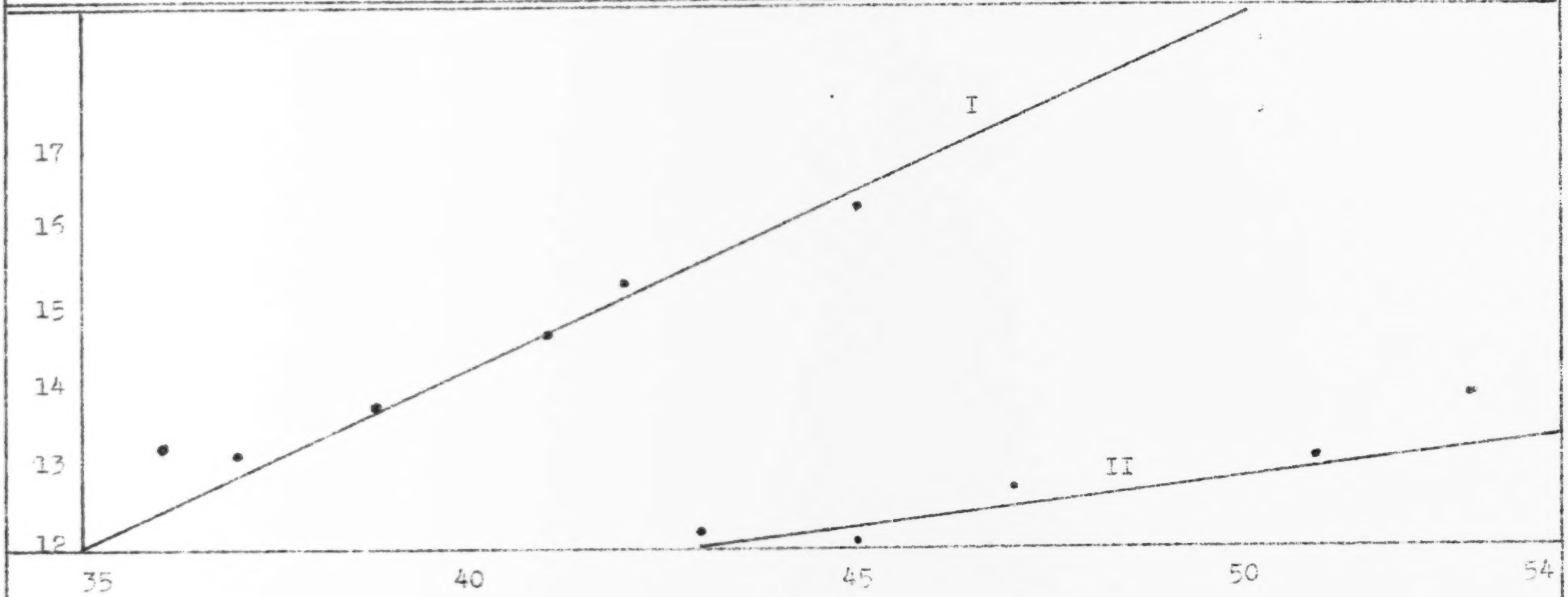
Intercept: a = 5.74

Regression Equation: Y = 5.74 + .149X

Correlation Coefficient: r = .998

CHART NO. 13

REGRESSION LINE GRAPHS



I. Line/Staff Employees - $Y = 32.5 + .461X$

II. Professional/Non-Professional Employees - $Y = 5.74 + .149X$

Note: With the difficulty of scaling these equations on this size paper, the scales have been abbreviated and the origin is not given. The purpose of these graphs is to illustrate, visually, the high correlation found in PSU full time employee growth rates by the square-cube law applied to specific groups.

CHART NO. 14

DISTRIBUTION PATTERN OF PSU FULL TIME EMPLOYEES BY LINE/STAFF DIVISION AND FISCAL YEAR

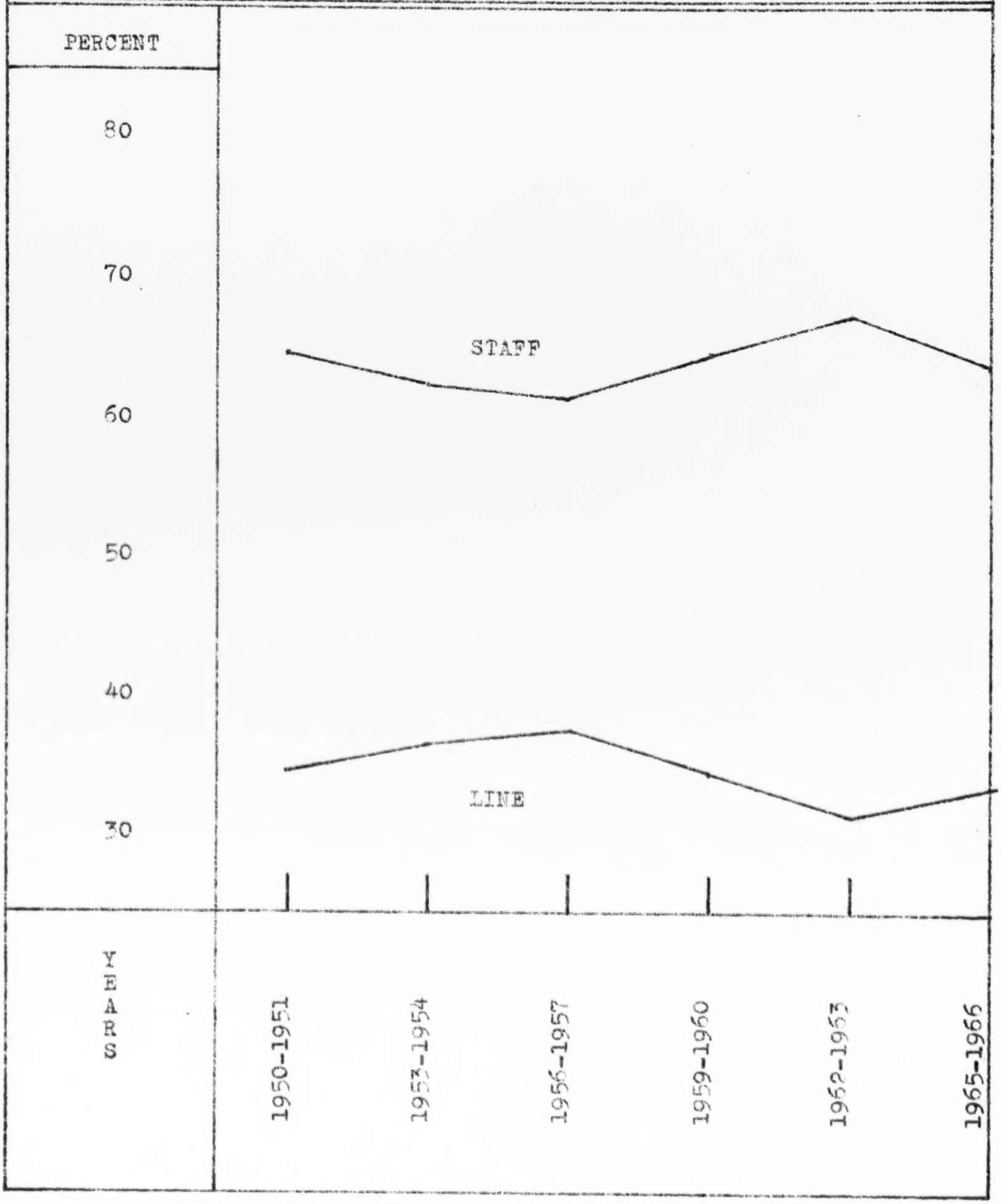
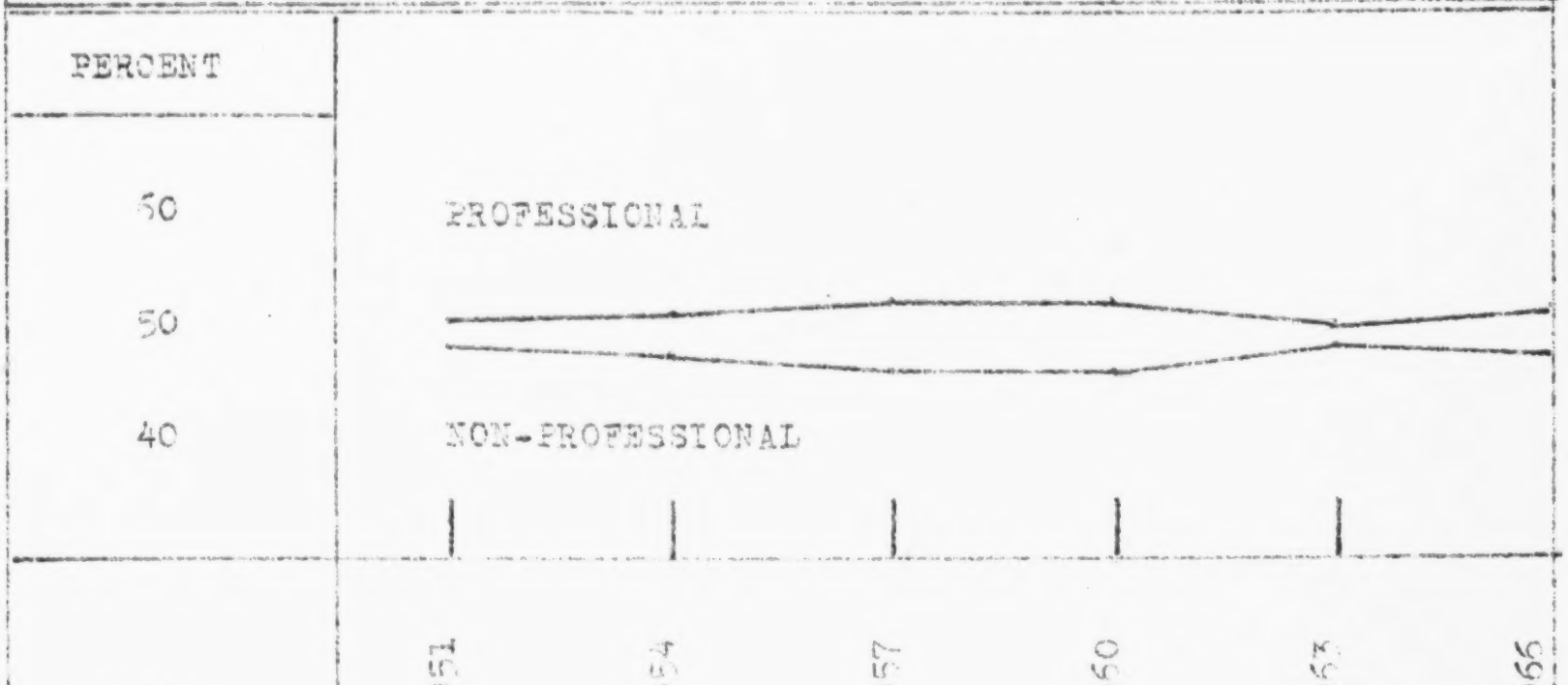


CHART NO. 15

DISTRIBUTION PATTERN OF PSU FULL TIME EMPLOYEES BY PROFESSIONAL/NON-PROFESSIONAL DIVISION AND FISCAL YEARS



FREQUENCY AND PERCENTAGE DISTRIBUTIONS

FISCAL YEARS	PROFESSIONAL		NON-PROFESSIONAL	
	N	PERCENT	N	PERCENT
1950-1951	1855	50.6	1779	49.4
1953-1954	1929	52.2	1766	47.8
1956-1957	2199	52.5	1991	47.5
1959-1960	2542	52.9	2172	47.1
1962-1963	2795	51.0	2662	49.0
1965-1966	3361	51.9	3099	48.1